



Understanding smallholder farmer grain legume technology adaptation, integration and preference in maize-based cropping systems using participatory action research in Malawi

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Abstract

Integration of grain legume technologies into maize based cropping systems is an applicable pathway to achieving sustainable intensification for Malawian smallholder farmers. To ensure system sustainability, targeted technologies must be developed with an understanding of how farmers adapt, integrate and prefer such technologies in their current systems. Diverse edaphic qualities, varying livelihood and management strategies as well as low resource endowment, in increasingly unpredictable climatic conditions, inherently render such an understanding challenging without active farmer experimentation. In this study, using the mother-baby farmer participatory action research approach, we aimed to understand farmer adaptation, integration and preference of annual (common bean, cowpea, groundnut and soyabean) and semi-perennial (pigeon pea) grain legume technologies in current maize based systems. During two growing seasons (2012-2014), a total of 317 farmers over four agroecologies experimented with, adapted and integrated on-farm demonstrated sole legume, mixed legume and mixed maize-legume intercropped systems, which included novel semi-perennial pigeon pea and mixed legume intercropped technologies, into their own individual on-farm plots ($n=1344$). Over the two growing seasons, sole legume, mixed maize-legume intercropped and mixed legume intercropped systems were cultivated by 87, 50 and 35 percent of farmers, respectively. Thirteen percent of total plots included pigeon pea with mixed legume plots having the highest percentage of pigeon pea (34%). Farmers compared all technologies grown within the two years to sole maize and preferred maize intercropped with one or more legume specie(s), mixed legume and sole legume systems 62, 19 and 10 percent of the time, respectively. The novel pigeon pea and mixed legume technologies stood out among comparisons. Farmers who intercropped mixed legume technologies with maize and especially those who included pigeon pea in a mixed legume technology, with or without maize, had a higher preference of such systems over sole maize in comparison to all other systems. Notably, mixed legume technologies were not intercropped with maize on demonstration trials, yet 7% of farmer plots were cultivated in these systems and were preferred 66% of the time; the addition of pigeon pea to these systems increased farmer preference over sole maize from 63 to 74 percent. These results indicate that farmers, through adaptation and experimentation, can further sustainably intensify their systems beyond that of demonstrated technologies. Development of future technologies should be targeted towards more intense maize-grain legume intercropped systems, which include both annual and semi-perennial grain legume species.

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